

# Notice of Allowability

Application No.

10/520,163

Examiner

Tiffany A. Fetzner

Applicant(s)

VOLKE ET AL.

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## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 1/08/2007 & the telephonic interview of 4/11/2007.
2. ☒ The allowed claim(s) is/are Examiner amended claims 15-28.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 4/12/2007.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

## Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 4/12/2007
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

**BRJ SHRIVASTAVA**  
**PRIMARY EXAMINER**

### Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney Mary J. Breiner Reg. No. 33,161** on April 11<sup>th</sup> 2007 along with authorization to charge any necessary fees to applicant's deposit account.
3. The application has been amended as follows:

**A) Replace claims 15 through 17 of the January 8<sup>th</sup> 2007 amendment and response with the following Examiner amended claims 15 through 17:**

**Claim 15** --- Probe head **configured** for NMR measurements in a magnetic system, **said magnetic system** comprising a bore extending in parallel with a base magnetic field for receiving the probe head through a lower opening thereof, wherein the probe head includes a body carrying **inside said body** at least one solenoid coil as a measuring coil, said solenoid coil having a coil axis perpendicular to the base magnetic field when inserted **into said bore through said lower opening**, a feed line towards the solenoid coil via which a sample material can be introduced into a measuring volume surrounded by said solenoid coil, wherein said feed line is configured **in relation to said measuring volume** for receiving and conveying sample containers through said measuring volume **by extending along said coil axis perpendicular to the direction of said lower opening in said bore of said magnetic system.** ---

**Claim 16** --- Probe head according to **claim 15**, wherein **said body of said probe head containing** said at least one solenoid coil is detachably connected to a **connective support element.** ---

**Claim 17** --- Probe head according to **claim 16**, wherein said **connective** support element and **said body of said probe head containing** said at least one solenoid coil are detachably connected by a plug-and-socket connector. ---

**B)** Insert claims 18 through 22 of the January 8<sup>th</sup> 2007 amendment and response:

**Claim 18** --- Probe head according to **claim 15**, wherein said feed line is configured for receiving a plurality of sample containers disposed in succession. ---

**Claim 19** --- Probe head according to **claim 15**, wherein said feed line is connected to a conveying mechanism that permits stepwise conveyance of said sample containers in said feed line. ---

**Claim 20** --- Probe head according to **claim 19**, wherein said conveying mechanism provides said conveyance by pressing a propelling agent into said feed line. ---

**Claim 21** --- Probe head according to **claim 15**, wherein said sample containers are constructed and arranged for complete introduction into said measuring volume. ---

**Claim 22** --- Probe head according to **claim 15**, wherein said sample containers are constructed and arranged for receiving a maximum sample volume of  $\leq 1$  ml. ---

**C) Replace claim 23 of the January 8<sup>th</sup> 2007 amendment and response with the following Examiner amended claim 23:**

**Claim 23** --- Probe head according to **claim 15**, wherein said feed line is passed from a receiving opening **in said body** of said probe head for said sample containers through said measuring volume to a discharge opening **in said body** of said probe head for said sample containers. ---

**D) Insert claim 24 of the January 8<sup>th</sup> 2007 amendment and response:**

**Claim 24** --- Probe head according to **claim 15**, wherein said feed line is of a tubular configuration. ---

**E) Replace claim 25 of the January 8<sup>th</sup> 2007 amendment and response with the following Examiner amended claim 25:**

**Claim 25** --- Probe head according to claim 15, further comprising a plurality of solenoid coils of different size which are **detachably** connected to said support body in alternation.---

**F) Insert claim 26 of the January 8<sup>th</sup> 2007 amendment and response:**

**Claim 26** --- Method of operating the probe head according to **any one of claims 15-25**, comprising charging the sample material into a sample container, introducing said sample container into said feed line and conveying in said feed line in a conveying

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direction to said measuring volume, and, after measurement, conveying via said feed line along the conveying direction said sample container out of said measuring volume.-

**G) Replace claims 27 and 28 of the January 8<sup>th</sup> 2007 amendment and response with the following Examiner amended claims 27 and 28:**

**Claim 27 --- Method of operating the probe head according to any one of claims 15-25, comprising charging the sample material into a sample container, introducing said sample container into said feed line and conveying in said feed line in a conveying direction to said measuring volume, and, after measurement, conveying via said feed line along the conveying direction said sample container out of said measuring volume, wherein said sample container is conveyed by a propelling agent in said feed line.---**

**Claim 28 --- Method of operating the probe head according to any one of claims 15-25, comprising charging the sample material into a sample container, introducing said sample container into said feed line and conveying in said feed line in a conveying direction to said measuring volume, and, after measurement, conveying via said feed line along the conveying direction said sample container out of said measuring volume, wherein a plurality of said sample containers containing same or different sample materials are introduced in succession into said feed line and are subsequently conveyed together in steps in said feed line for measuring each in succession.---**

**In the specification**

**H) At Page 3, line 23 to page 4, line 7, amend the paragraph as follows:**

In a manner known per se, the present probe head consists of a body carrying a solenoid coil as measuring coil and of a feed line leading to the solenoid coil, via which a sample material can be introduced into a measuring volume surrounded by the solenoid coil. The body may have an elongate configuration, for instance, in which case the coil axis of the solenoid coil is preferably oriented **orthogonally** on the longitudinal axis of the body. In the present probe head, the feed line leading to the solenoid coil is configured for receiving and conveying sample containers. It must therefore present a sufficient inside diameter for receiving the sample containers. Such a feed line may have a tubular configuration, for instance, is passed through the solenoid coil and consists of an NMR material at least inside the solenoid coil. The sample to be measured is then charged into a suitable sample container, is conveyed in the feed line up to the measuring volume, is measured there and is then conveyed out of the measuring volume again. The sample containers may be so selected that they receive only the minimum sample quantity that is required for the measurement. The diameter of the sample container is adapted to the inside diameter of the feed line in order to allow for unproblematic conveyance inside the feed line.

**I) Page 4, line 16 to page 5, line 2, amend the paragraph as follows:**

The solenoid coil is preferably detachably connected to the body **of the probe head** so that it is easy to exchange in a simple manner at any time. Due to this detachable connection of the solenoid coil to the body of the probe head, it is possible to hold a plurality of solenoid coils of different diameters available and to insert them into the probe head in the case of need. On account of the simple exchangeability, the measuring volume can be adapted easily to the respective sample volumes to be measured so that the charging factor is at an optimum and hence a very good signal-to-

noise ratio will be achieved. The application of solenoid coils instead of frequently used Helmholtz-type coils or saddle coils moreover entails the advantage that the HF homogeneity is excellent throughout the sample volume in the solenoid coil. Solenoid coils are furthermore simple to produce at acceptable costs. According to the preferred embodiment of the present probe head, the connection between the solenoid coils and **a connective support element is realized** in the form of a plug-and-socket connector so that the coil can be exchanged merely by removal of one coil and plugging of the respectively envisaged other coil. The plug-and-socket connectors provide preferably the electrical contacts between the HF lines and the coil at the same time. The detachable connection may, of course, also be **realized** in another form, e.g. in the form of a clamp joint.

**J) Page 6, lines 14-30, amend the paragraph as follows:**

Fig. 1 is an exemplary view of a typical arrangement for NMR spectroscopy with a superconducting base field solenoid 1. This superconducting base field solenoid 1 is vertically disposed in a Dewar vessel 2 and presents a central bore 3 for the introduction of the sample to be measured. A very homogeneous static magnetic field  $B_0$  prevails in this bore 3, whose orientation is roughly **indicated** in the figure. For measuring, a sample is supplied to a probe head 4, **having a body 4a**, that is introduced into the bore of the base field solenoid 1. This is schematically roughly indicated by the double arrow **shown** in Fig. 1. The probe head 4 comprises appropriate connectors 5 for the HF supply of the integrated emitting and receiving coil or for conveying the received signals on its end projecting from the base field solenoid 1. Such a probe head 4 includes normally an adapter circuit for adaptation of the probe head to the usual input resistance of 50  $\Omega$  at the input of the probe head, and includes also a waveguide resonator that is matched to the emission frequency. This component is not the subject matter of the present invention and is therefore not shown explicitly in the present embodiment. They may be configured in the same manner as in other known probe heads in a manner known to those skilled in the art.

**K) Page 7, lines 16-28, amend the paragraph as follows:**

The sample materials are charged into sample containers 10 consisting, in the present example, of short small tubes of a material not interfering with the NMR measurement, which can be closed in a water-tight and air-tight manner by means of a plug 11 made of Teflon, for instance. In the present example, a **feeding tube or feed line** 12 of appropriate diameter is passed through the solenoid coil for conveying these sample containers 10, in which tube the sample containers 10 can be conveyed. This configuration permits the introduction of a great number of sample containers 10 with different samples into the tube and the conveyance of the sample container 10 out of the solenoid coil 7 by means of an air flow after each measurement of a specific sample, i.e. a sample in one of the sample containers 10, as well as the introduction of the next sample in the respective sample container 10. It is also possible to use a liquid as conveying agent, for instance in an approach to achieve the matching of susceptibility in the measuring volume 9.

**L) Page 7, line 30 to page 8, line 5, amend the paragraph as follows:**

Compared against conventional sample exchangers, wherein individual small NMR tubes are vertically introduced into the NMR probe head, this possibility of automatic sample change incurs substantially lower costs and is sturdier. In particular, several sample containers 10 with different samples can be introduced into an appropriate collector section 14 of the **feeding** tube 12 with the present configuration of the probe head or the present method, respectively, from which collector section the sample containers 10 are then conveyed in steps through the measuring volume 9. The orientation of the magnetic field is indicated by the arrow  $B_0$  in Fig. 3.

**M) Page 8, lines 7-15, amend the paragraph as follows:**



Fig. 3 illustrates an example of the extension of the **feeding** tube 12 of the probe head 4, with the solenoid coil 7 being roughly indicated at the front end of the probe head 4. The **feeding** tube 12 is connected to a conveyor device 13 that conveys the sample containers 10, which are initially introduced in succession in a collector section 14 between the conveyor device 13 and the probe head 4, for measurement through the measuring volume of the probe head 4. The probe head 4 need not be taken out of the bore 3 of the superconducting base field solenoid 1 to this end. The samples already measured are output into an appropriate collector station 15 at the other end of the **feeding** tube 12. The orientation of the magnetic field is indicated by the arrow  $B_0$  in Fig. 3.

The following is a statement of **Reasons for Allowance**

4. With respect to **Examiner amended independent claim 15**, this claim is considered to be allowable over the prior art of record because the prior art of record neither discloses nor suggests an NMR probe head configured for NMR measurements in a magnetic system an NMR probe head where the magnetic system comprises a bore extending parallel with a base magnetic field configured for receiving the applicant's NMR probe head and the NMR probe head itself comprises a probe head body, a solenoid coil within the NMR probe head body, and a support wherein the NMR probe head is inserted into, and removed from, an NMR Magnetic system, by a lower opening in the magnetic system bore which is oriented parallel to the base magnetic field of the system, while NMR sample material is introduced into a measuring volume of the NMR probe head surrounded by a solenoid coil having a coil axis that is oriented perpendicular to the base magnetic field of the NMR magnetic system, through a feed tube line that is configured for receiving and conveying sample containers through said measuring volume of the perpendicularly oriented solenoid coil (i.e. with respect to the base magnetic field) of the NMR probe head body. It is the entire combination of the claim limitations taken as a whole, as set forth in the **examiner amended claim 15** that constitutes both the novelty and non-obviousness of applicant's **independent examiner amended claim 15**.

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5. With respect to the **examiner amended** and / or **dependent claims 16-28**, these claims are considered to be allowable over the prior art of record because they each depend from allowable **examiner amended independent claim 15**.
6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### Examiner's Amendment to the Drawings

7. The following changes to the drawings have been approved by the examiner and agreed upon by applicant:
- A) Applicant will amend Fig. 1 adding a **reference number 4a** to indicate the body portion of the overall probe head **component 4**.
  - B) Applicant will amend Fig. 1 to include an indication of the feeding tube 12.
  - C) Applicant will amend Fig. 1 to include **the appropriate indication on either end of component 12 that the feed tube component 12 extends outwards beyond the range of figure 1**, so that the correspondence between figs 2, 3, and 1 is clearly visible.
  - D) Applicant will amend Fig. 1 to include **solenoid coil component 7**, which is also shown in the alternative orientations of figures 2 and 3.
  - E) Applicant will amend Fig. 1 to **show more clearly the broken lines** representing the area through which probe head 4 extends, via the lower opening, into the bore 3 of the magnet system 1.
  - F) Applicant will amend Fig. 2 to include component numbers **4a, 4, 10, and 11** where ever they occur in **figure 2**, as a means of clarifying the structure shown.
  - G) Applicant will amend Fig. 2 to include hatched lines in combination with **plug component 11** so that the plugs and **sample containers 10** become more clearly visible in relationship to applicant's **NMR probe head 4**.
  - H) Applicant will amend Fig. 3 to include the label of "**conveyor device**" for the blank box **component 13**.

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- I) Applicant will amend Fig. 3 to include the label of "**feeding tube**" for the **component 12** so that it is clear that component 12 is a tube with the arrows identifying the directional aspect of the NMR probe system, as opposed to a simple schematic line.
8. In order to **avoid abandonment** of the application, **applicant must make these above agreed upon drawing changes.**

#### **Examiner's Comment**

9. All of the Examiner amendments made herein were done in order to better clarify the structural components and relationships of the invention as originally filed, and shown in the originally filed drawings, or to resolve remaining formal matters such as a consistent and proper antecedent basis for each respective component. No new matter was added. Therefore the application as amended herein is believed by the examiner to be free of new matter

#### ***Priority***

10. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

#### ***Prior Art of Record***

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- A) **Bartuska** US patent 5,146,166 issued September 8<sup>th</sup> 1992.
- B) **Gilderdale et al.**, US patent 5,876,338 issued March 2<sup>nd</sup> 1999.
- C) **McKenna** US patent 4,859,949 issued August 22<sup>nd</sup> 1989.

#### **Conclusion**

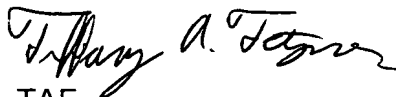
12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

13. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax**

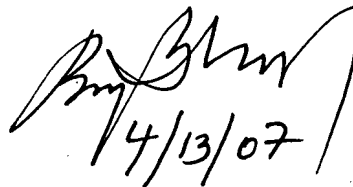
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**phone number** for the organization where this application or proceeding is assigned is **(571) 273-8300**.

14. Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system Status information for published applications may be obtained from either Private PMR or Public PMR. Status information for unpublished applications is available through Private PMR only. For more information about the PMR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PMR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
TAF

April 12, 2007

  
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PRIMARY EXAMINER

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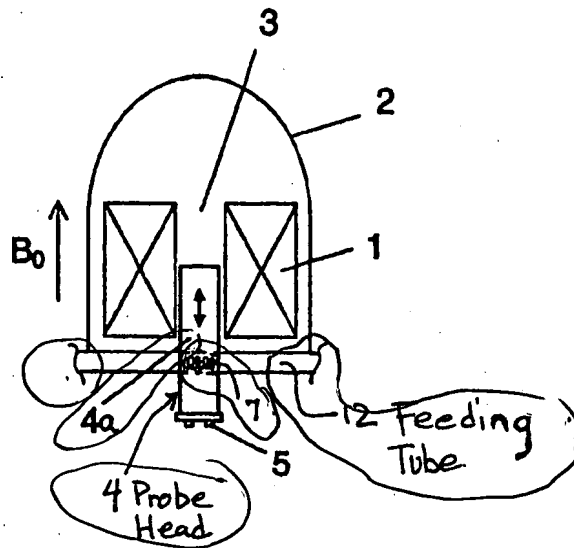


Fig. 1

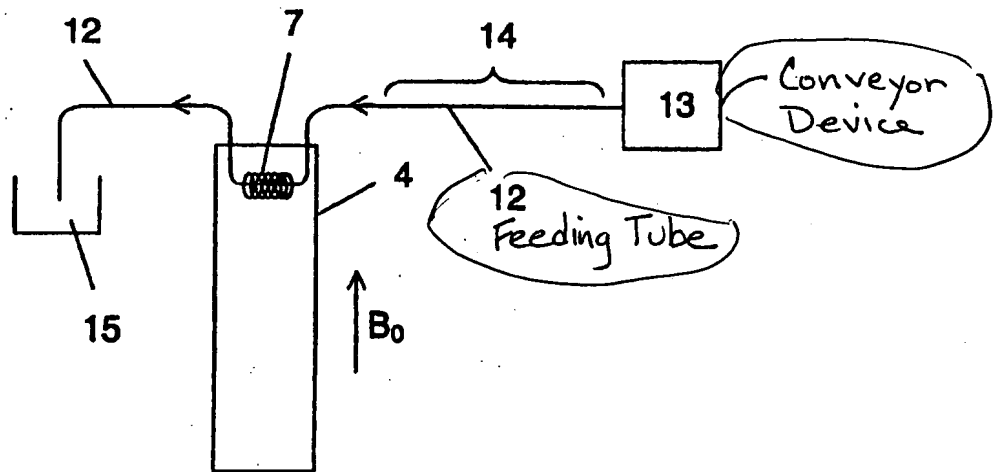


Fig. 3

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Approved Annotated Drawings Showing Charges

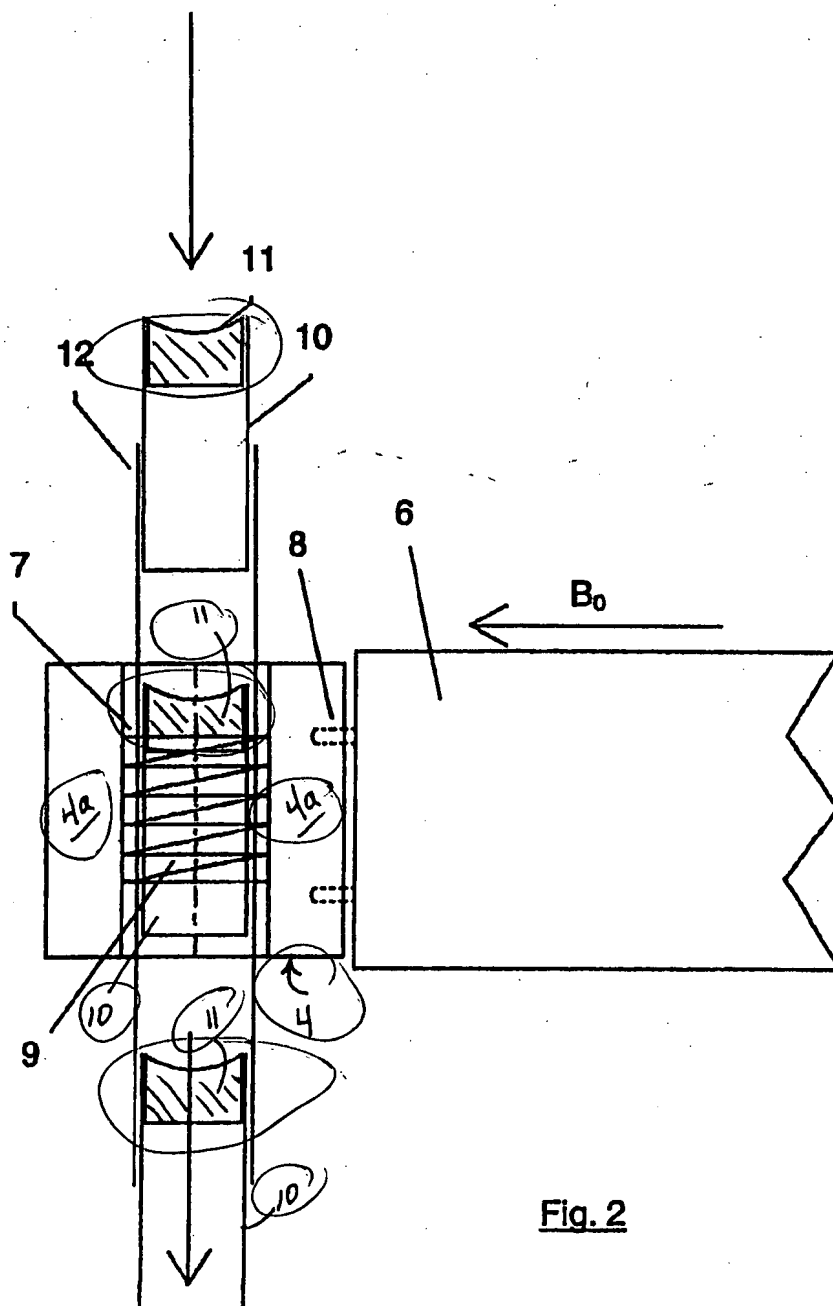


Fig. 2